GENERAL QUALITY ASSURANCE PROJECT PLAN (QAPP)

Lane Street Ground Water Contamination Area
Limited Ground Water Sampling Study
Elkhart, Indiana
EPA ID: INN000510229

Prepared By:

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ROBERTS Project No. 10-10378-30

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INTRODUCTION

The Lane Street Ground Water Contamination Area ("Lane Street") is an U.S. Environmental Protection Agency ("EPA") Superfund site (EPA ID INN000510229) located in Elkhart, Indiana. The site is generally located near Lane Street and the industrial park north of Lane Street. This limited ground water investigation will focus on the northern portion of this Superfund site (hereinafter referred to as the "Study Area"). Currently, a documented source of contamination has not been identified. The Indiana Department of Environmental Management ("IDEM") and EPA have both conducted investigations within the Study Area that have identified chlorinated solvent ground water contamination from just south of Cooper Drive and continuing south-southwesterly into the Lane Street residential neighborhood. In a recent ground water screening investigation conducted by Roberts Environmental Services, LLC ("ROBERTS") in March 2011, ground water contamination was also identified directly north of Cooper Drive. Primary chemicals of concern ("COCs") in the Study Area include trichloroethylene ("TCE") and also tetrachloroethylene ("PERC"). This investigation will involve obtaining representative ground water samples from different locations and depths within the unconfined aquifer across the Study Area. General data quality objectives ("DQOs"), such as adequate quality assurance/quality control ("QA/QC") and field documentation, will help ensure the reliability and reproducibility of the data.

1.0 HEALTH AND SAFETY PLAN (HASP)

1.1 Hazards and Risk Evaluation

A hazard and risk evaluation associated with project activities was performed to ensure the safety of personnel working in the Study Area. Chlorinated solvents may be encountered in the soil and ground water within the Study Area during investigation and remediation activities. Typical potential chemical hazards associated with chlorinated solvents are shown on the MSDSs/safety cards in Appendix A (as represented by tetrachloroethylene (PERC) and trichloroethylene (TCE)). Fire and explosion hazards are typically not associated with chlorinated solvents, but can occur under certain conditions. Inhalation hazards may exist at high concentrations. However, the diluted nature and degradation of the COCs would minimize fire and/or explosion hazards.

Physical hazards that may be encountered during project activities include:

- Slippery/uneven footing
- Possible heat stress
- Possible cold stress
- Injury from drilling equipment
- Injury from vehicles

The primary routes of exposure would be ingestion, skin contact, and possibly inhalation. Proper personal protective equipment and sampling procedures should significantly reduce the chance of exposure.

1.2 Personnel

The following personnel will participate in the investigation and remediation activities:

- **David D. Jeffers**, L.P.G, Senior Hydrogeologist, and Study Area Health & Safety Coordinator (SHSC)
- **Steve Barnes,** Geologist and Alternate SHSC
- **Jeffrey C. Roberts,** Senior Project Manager
- **Justin Blotkamp**, Environmental Scientist/Technician

This HASP will also be made available for review by subcontracted personnel (surveyors, etc.). However, it should be noted that ROBERTS is not ultimately responsible for subcontractor's health & safety. This HASP will only serve as an informational tool for subcontractors to be aware of the potential hazards associated with the Study Area.

1.3 Levels of Personal Protection

Level D (modified) personal protection is required at the Study Area during project activities. The Level D protection includes:

- Seasonal work clothing
- Steel toe boots or shoes
- Nitrile gloves (when in contact with contaminated media)
- Safety glasses
- Tyvek® suit (optional)
- Hard Hat (when working with drilling equipment or heavy machinery)
- High visibility vests (working near public roadways or other high traffic areas)

1.4 Decontamination

Personnel or equipment leaving the Study Area or re-used between samples (i.e., split spoon, MacroCore, etc.) shall be decontaminated. For personnel involved in Level D work, decontamination other than normal washing is not required. Equipment is cleaned with soap and water within the Study Area. The following decontamination equipment is required:

- 5-gallon pails
- Plastic sheeting
- Plastic bags
- Brushes
- Soap (Alconox®) and water
- Paper towels
- Nitrile Gloves

1.5 Study Area Access Control

Only trained and knowledgeable persons are allowed access into the work area. Work areas will be generally defined with hi-visibility cones or similar items.

1.6 Emergency Procedures

All Study Area personnel involved with project activities should be made aware of the nearest phone (mobile), emergency telephone numbers and the route to the hospital, emergency medical information, and escape routes. The following first aid information should also be made available:

Eyes: Flush with water for 15 minutes. Seek medical attention.
Skin: Wash immediately with soap and water. Seek medical attention if any irritation persists.
Inhalation: Move to fresh air.
Ingestion: Dilute with large quantities of water or milk. Do not induce vomiting. Seek medical attention.

All Personnel Must Review*

1.7 Emergency Phone Numbers

The following emergency phone numbers will be made available:

Roberts Environmental Services, LLC	(574) 537-0881
Emergency Fire/Police/Rescue	911
Emergency Spill (IDEM)	1-888-233-7745

1.8 Personnel Training Qualifications and Certifications

Project personnel have obtained the following relevant training and certifications:

David D. Jeffers

Indiana Licensed Professional Geologist (L.P.G.) No. 1862
Red Cross First Aid/CPR Training
OSHA 40-Hour HAZWOPER Training
Indiana Licensed Water Well Driller #2073

Steve Barnes

Red Cross First Aid/CPR Training
OSHA 40-Hour HAZWOPER Training

Jeffrey C. Roberts

OSHA 40-Hour HAZWOPER Training
Red Cross First Aid/CPR Training
Indiana Licensed Water Well Driller #2121

Justin Blotkamp

OSHA 40-Hour HAZWOPER Training
Red Cross First Aid/CPR Training
Indiana Licensed Water Well Driller #2308

1.9 U.S. EPA and OSHA Regulations

ROBERTS personnel involved with this work are required to become familiar with, and conform to, the provisions of this Health & Safety Plan ("HASP"). Applicable OSHA standards and regulations governing record keeping and reporting requirements have been maintained for specific aspects of the Health & Safety Program. Each project employee has successfully completed the EPA equivalent 40-hour health and safety training course with refreshers.

2.0 SAMPLING & ANALYSIS PLAN (SAP)

Ground water sampling will be performed in the Study Area. In general, the depth to ground water is approximately 6.0 to 10.0-feet below surface grade ("bsg") across the study area. Soils at the Study Area generally consist of silty sands near the surface and sands & gravels at depth. The primary aquifer zones at the Study Area consist of sand and gravel layers at depths of approximately 12 to 30 feet bsg and 40 to 50 feet bsg. Soil boring and monitoring well installations will be consistent with Indiana Department of Natural Resources (IDNR) guidelines/rules (IC 13-30, IC 25-39, 312 IAC 12, 312 IAC 13, and 329 IAC 9) and the IDEM Non-Rule Policy Document (NPD) "Drilling Procedures and Monitoring Well Construction Guidelines" dated August 31, 2006. Soil cuttings and ground water from well development/sampling will be containerized in steel, 55-gallon drums for subsequent disposal. The following sections describe sampling procedures utilized at the Study Area and the QA/QC program.

2.1 Soil Sampling

Soil samples will be collected following typical IDEM and U.S.EPA guidelines for soil sampling. However, soil samples will be field screened only (i.e., no soil laboratory analysis will occur). Soil boring locations with ID numbers are documented on field maps as they are installed. The following section describes the procedures utilized at the site for soil sampling.

2.1.1 Sampling Equipment & Methods

The primary soil sampling equipment at the site consists of a direct-push drill rig. A Geoprobe® Model 6620DT will be utilized for the vast majority of soil sampling. Soil samples are collected continuously in each boring utilizing a 4.0-feet or 5.0-feet long by 2.25-inch diameter macrocore sampling device. A new macrocore sample liner is utilized between each sample interval. Discrete soil sampling procedures will also be utilized. Discrete soil sampling entails setting an end plug in the macrocore sampling device, which is held in-place by lightweight center rods that are placed in 2.25-inch diameter outer rods. The macrocore is then advanced to the top of the desired sampling interval (adding additional center rods and outer rods with depth). At this point, another center rod is not added to the drill string, which allows the end plug to be displaced within the macrocore by the soil sample as the drill string is advanced through the sampling interval. Discrete sampling is particularly useful when sampling below the water table and often necessary due to heaving sands. Soil borings that are not completed with permanent monitoring wells will be abandoned with bentonite grout. Abandoned borings that are installed through asphalt or concrete will also patched with similar materials at the surface.

New nitrile gloves are donned before collecting each sample in order to prevent potential cross-contamination. Macrocore tubes, hand-augers, drill rods, etc. are cleaned between

borings by washing/scrubbing in an Alconox® soap solution and double-rinsing with filtered, deionized water.

2.1.2 Field Screening

Collected soil samples will be screened with a Perkin Elmer Photovac MicroFID® field flame-ionization detector ("FID") and/or a photoionization detector ("PID"). The field FID/PID units gives relative readings on the amount of volatile vapors in the sample. The FID/PID is calibrated at least weekly in accordance with the manufacturer's specifications or whenever the FID/PID units require field calibration. Since field FID readings are relative, daily calibration is not needed. Field screening soil samples are placed in plastic freezer bags that are labeled with the corresponding sample I.D. number (i.e., boring number and depth interval). The field screening samples may be warmed in a vehicle before screening with the FID/PID if weather conditions warrant. Field FID/PID readings and soil descriptions (including any staining or odors) are documented on field boring logs that are completed for each boring.

2.1.3 Soil Sample Descriptions

Field FID readings and soil descriptions (including any staining or odors) are documented on field boring logs that are completed for each boring. The USDA soil classification system is utilized to describe the soils. Munsell® soil or rock color charts are used to describe the color of the samples. An example field boring log is provided in Appendix B. Information on the log includes: date of boring, general location, boring number, sample depth, sample time, percent recovery, FID reading, submission for lab analysis, and a geologic description section. Personnel logging the boring, sampling equipment, and weather conditions are also noted on the log. Field boring log information is then transferred to final boring logs completed for each location. An Indiana Licensed Professional Geologist (L.P.G.) will supervise the description of soils. Note that if a soil boring has previously been completed within approximately 10-feet of a new boring location, the boring information obtained from the previous will also be considered representative for the new location.

2.2 Monitoring Well Installations, Sampling, & Analysis

Monitoring wells will be constructed in the Study Area following IDNR and IDEM requirements and guidelines. Monitoring well locations will be surveyed by a licensed surveyor after installation. The following section describes the procedures utilized at the Study Area for monitoring well installations, sampling, and analysis. Detailed QA/QC procedures for ground water sampling are described in Section 2.4.

2.2.1 Installation Equipment & Methods

The primary monitoring well installation equipment consists of a direct-push drill rig. A Geoprobe Model 6620DT will be utilized for the monitoring well installations. After completing a continuously sampled soil boring (as described in Section 2.1), monitoring wells may be installed. Typical monitoring well installation methods involve advancing 3.25-inch diameter probe rods (fitted with an expendable point) to the desired depth. Each probe rod is also fitted with o-rings to seal the rod string. In order to control heaving sands, filtered, deionized water may be used to fill the probe rods during advancement (typically only necessary with deeper wells installed well below the water table). Once the desired depth is reached, pre-packed 1.0-inch diameter well screen and riser is inserted through the probe rods. The bottom plug is displaced while partially retracting the probe rods. New, clean sand filter pack is then installed no more than 2.0-feet above the top of the well screen. A filter pack seal, consisting of pelletized bentonite is then placed no more than 2.0-feet above the filter pack. The remaining annulus is then pressure grouted with bentonite grout to the surface while retracting the probe rods. Note that pressure grouting may not be necessary during some shallow well installations because the constructed well is completed to within 1.0 to 3.0 feet of the ground surface (well screen + sand pack + filter pack seal). Monitoring wells that straddle the water table will be completed with 10-feet of pre-packed well screen, while monitoring wells installed below the water table will be completed with 5.0-feet of pre-packed well screen. Water-tight manhole covers will be used to complete flush-mount installations. In those areas with a seasonally high water table, wells may be completed with above-grade steel procovers. A lockable, watertight plug with the well ID number written in permanent ink is fitted on each well and secured with keyed alike locks. The covers are installed within a concrete pad to a depth of approximately 1.5-feet bsg.

2.2.2 Well Development & Surveying

After monitoring well installations are complete, the monitoring wells will be developed to ensure connectivity with the surrounding aquifer materials. Well development entails initially measuring the static water level and depth of the well to calculate the approximate volume of water in one (1) well volume. For a 1.0-inch diameter well, approximately 0.041 gallons of water per foot of water column exist in the well. Surging of the well is initiated by lowering a 0.7-inch diameter by 3.0-feet long bailer to the screened interval. Surging helps bridge finer formation particles within the filter pack by creating water movement into (raising bailer) and out of the well (lowering bailer). The bailer is forcefully retracted and this procedure is repeated several times. A peristaltic pump fitted with new 3/8-inch diameter, polyethylene, downwell tubing is then used to pump water from the well (at the greatest pumping rate). The pump tubing is periodically raised and lowered throughout the screened interval of the well during pumping. The amount and turbidity of the development water is observed and evaluated until the water is relatively clear or at least 3-well volumes are removed from the well. The bailer surging procedure and pumping procedures are then repeated 1 to 2 more instances depending on the clarity of the development water.

Top of casing elevations and well locations will be surveyed by a licensed surveyor after installation. Mean sea level ("msl") elevations are recorded relative to a USGS benchmark data. Horizontal well locations are surveyed to within 0.1-feet (typically within a greater accuracy) relative to a Study Area benchmark.

2.2.3 Sampling Equipment

Monitoring well sampling equipment includes a MasterFlex® peristaltic pump, a Solinst® dual-phase water level meter, a Hanna® model 9828 multi-parameter meter with a transparent in-line flow-through cell, new 0.7-inch diameter by 3.0-feet long polyethylene bailers (with new nylon bailer cord), new 3/8-inch diameter polyethylene tubing, new silicone peristaltic pump tubing, appropriate critically clean laboratory provided containers, new nitrile gloves, Study Area maps, and monitoring well sampling forms. New disposable items (i.e., tubing, bailers, gloves, bailer cord, etc.) are used on each well. The water level meter is rinsed with a mild Alconox® soap solution and deionized water after each use, while the multi-parameter meter is cleaned per manufacturer's recommendations by rinsing with deionized water after each use. The multi-parameter meter is checked for accuracy at the beginning and end of each sampling day with a standard 7.0 pH buffer solution. If the beginning of day check shows a differential of more than 0.1 standard unit ("SU") pH, the instrument is calibrated according to manufacturer's specifications. The daily check and calibration information are recorded in the sampler's field notebook or at the top of the monitoring well sampling form (note: a calibration data file is stored in the meter's memory also).

2.2.4 Monitoring Well Sampling Procedures

At least 48-hours after well development activities, ROBERTS personnel will return to the Study Area and sample the monitoring well using low flow sampling techniques in general conformance with the IDEM Technical Memorandum "*Micro-Purge Sampling for Monitoring* Wells" dated January 8, 2003. These procedures entail using a peristaltic pump to purge each well of at least three (3) well volumes at no more than 1.0 liter/minute. Static water level readings will be collected and recorded on ROBERTS' Monitoring Well Sampling Forms (Appendix B) prior to purging activities. Downwell pump tubing is placed at the approximate center of the screened interval. After each well volume is purged from the well, pH, dissolved oxygen ("DO"), oxidation reduction potential ("ORP"), conductivity, and temperature readings are evaluated in the field via a flow-through cell using a multi-parameter meter. If after three (3) well volumes are purged and two (2) consecutive field parameter readings are within acceptable stabilization ranges, the well is considered adequately purged (and therefore producing fresh water from the surrounding aquifer). Acceptable stabilization ranges include: 0.1 SU for pH; 3% for conductivity and temperature; 10 microvolts for ORP; and 10% for DO. If the field parameters have not stabilized within acceptable limits, another well volume is purged from the well and field readings are again evaluated for stabilization. This procedure is repeated until stabilization is obtained (typically within 3 to 4 well volumes). Once stabilization is obtained, samples from intermediate and deep aquifer

zone wells will be collected using the peristaltic pump, while samples from water table wells will be collected with a new, disposable, polyethylene bailer.

2.2.5 Ground Water Analysis Methods

Ground water laboratory analysis methods are consistent with IDEM RISC guidelines with acceptable reporting limits at or below residential default closure levels ("RDCLs") (per Appendix 2 of IDEM RISC Technical Guide). Primary COCs at the Study Area include chlorinated VOCs. Further, pH, DO, temperature, ORP, and conductivity are measured in the field with a Hanna® model 9828 multi-parameter meter with a transparent in-line flow-through cell. The following table lists COCs and water analytical methods that are utilized at the Study Area.

COCs/Parameter	Analytical Method	Amount/Preservation
VOCs	Method 8260 (Level II Data Package)	Minimum 2-40ml vials, 3 vials are preferred. Hydrochloric Acid (HCL) preservation - Chill to 4°C.

2.3 VAS & Temporary Well Installations, Sampling, & Analysis

Temporary wells will be installed within the Study Area to collect ground water samples. Temporary well installation typically involves inserting a 1.0-inch diameter PVC screen and riser into the borehole. Temporary wells ("TWs") typically straddle the water table and are set with 10-feet of screen. The TWs are typically purged of at least one (1) well volume prior to sampling with a bailer or peristaltic pump. A Geoprobe® Screen Point (SP16) sampling device will also be utilized in the Study Area to collect ground water samples for screening purposes from deeper zones within the aquifer (i.e., vertical aquifer screening - "VAS"). The SP16 sampling device consists of an approximately 1.25-inch diameter by 4.0-feet long stainless steel screen that is protected by an outer sheath. An end plug is placed at the bottom of the SP16 and the device is driven to depth (deepest sample point). At this time, the probe rods are retracted approximately 4.0-feet thereby extracting the sheath and exposing the screen to the aquifer formation. At least 1.0-gallon of water is purged from the SP16 prior to sampling. The SP16 can then be raised to other sample depths within the same boring. A peristaltic pump is used to sample the VAS locations. Laboratory analysis methods will be analogous to the methods listed in Section 2.2.5.

2.4 QA/QC Program

The quality assurance/quality control ("QA/QC") program at the Study Area will be consistent with IDEM RISC guidelines. The following tables show typical IDEM RISC QA/QC requirements:

Minimum Sampling QA/QC Requirements
Chain-of-custody form
Date and time each sample was collected
Map indicating sampling locations
Documentation of any field measurements and notable observations
Use of equipment blanks and trip blanks
Use of field duplicates, matrix duplicates, and matrix spike duplicates

Laboratory Required QC Information
Completed chain-of-custody form
Date and time of receipt
Sample condition upon receipt
Sample identification number
Sample preparation, extraction, cleanup, or digestion method
Analytical method
The precision, accuracy (or bias), representativeness, comparability, and completeness (PARCC) requirements for each target analyte (including calibration requirements)
Analytical results, including appropriate level of laboratory data quality deliverables
Case narrative indicating any deviations from standard analytical procedures
Corrective action criteria for any deficiencies noted by a review of QA/QC procedures and the DQA

From IDEM RISC Technical Guide – February 15, 2001

QA/QC Samples	Media Sampled	Comments
MS/MSD	Ground water	This sample should be collected in a location with the least amount of suspected contamination. This sample indicates whether the matrix that the sample was collected from (i.e., ground water) interferes with the accuracy and precision of the analytical method. It compares the relative percent difference (RPD) of each sample result. The MS/MSD sample should be collected at a frequency of 1 per 20 samples.
Field Duplicate (FD)	Ground Water	This sample should be collected in a location with suspected contamination. The duplicate collection should occur as close as possible in space and time to the original sample location. This sample documents the variability of the sampling process and matrix homogeneity. It compares the RPD between the two results. The field duplicate should be collected at a frequency of 1 per 20 samples.
Trip Blank (TB)	Ground Water	This sample is to be submitted to the laboratory only when volatile organic compounds are being analyzed. It indicates whether storage, shipment, or ambient environment of sample collection could have contaminated samples. Only one trip blank per cooler containing ground water VOC samples should be submitted for laboratory analysis.

From IDEM RISC Technical Guide – February 15, 2001

Note that field equipment blanks will not be performed since all primary sampling equipment will consist of new materials (i.e., bailers, well tubing, bailer cord, pump tubing, gloves, macrocore sample liners, etc.). FDs and MS/MSD samples will be collected at a rate of one (1) per twenty (20). A certified NELAC laboratory will perform the ground water analysis. Additional QA/QC procedures utilized when conducting sampling at the Study Area consist of:

- Accurately labeling each laboratory provided sample container with the sample I.D., date, and time of collection at a minimum;
- Donning new nitrile gloves before collecting/handling each sample and whenever handling new or decontaminated sampling equipment;
- Proper decontamination procedures are utilized for auxiliary equipment that is re-used between sample locations (i.e., macrocore sampling device, hand-auger, water level meter, etc.), including, washing with a non-phosphate detergent and rinsing with deionized water;
- Keeping general work area clean and free of debris/trash;
- Properly packing sample containers in coolers immediately after sample collection. Glass containers are placed in bubble wrap and ice is placed in the cooler. The cooler temperature is periodically monitored and additional ice is added to the cooler as needed.

- Chain-of-Custody (C-O-C) forms are completed indicating sample I.D., date and time of collection, requested analysis, number of containers per sample, media, sampler's signature, etc. The C-O-C form should also note Level II QA/QC required. The completed C-O-C form is then placed within a re-sealable plastic bag inside the cooler.
- Coolers are packed so as to minimize movement of the sample containers and double-sealed with packing tape around each end of the cooler before shipment to the lab.

3.0 DATA QUALITY ASSESMENT (DQA)

DQA involves assessing the effectiveness of the sample design, sampling procedures, and laboratory analysis. DQA is used to ensure that the sampling and analytical quality are adequate to meet the precision, accuracy, representativeness, comparability, and completeness ("PARCC") requirements established in the data quality objectives ("DQOs"). DQA identifies the review process needed to support project requirements and confirms that the field sampling QA/QC event, the field documentation, and the QA/QC samples provide useable data. DQA also evaluates the final results of the Study Area investigation and compares them to the closure levels. *[from IDEM RISC Technical Guide]*

Assessment of field and laboratory data will be continually performed as part of the investigation activities conducted within the Study Area. The primary data assessment activity will include comparison of COC concentrations to RDCLs and appropriate screening levels. Additional DQA activities include the use of trip blanks ("TBs"), field duplicates ("FDs"), and matrix spikes/matrix spike duplicates ("MS/MSDs").

4.0 REFERENCES

IDEM – OLQ, 2003, "*Micro-Purge Sampling for Monitoring Wells*", Technical Memorandum.

IDEM – OLQ, 2006, "*Drilling Procedures and Monitoring Well Construction Guidelines*", Non-Rule Policy Document.

IDEM, 2001. "*Risk Integrated System of Closure; Technical Resource Guidance Document*". Indiana Department of Environmental Management, RISC, February 15, 2001.

IDNR, Title 312 Natural Resources Commission, Article 13 "Water Well Drillers".

APPENDIX A

Material Safety Data Sheets (MSDSs)

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

TRICHLOROETHYLENE
1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
C_2HCl_3/ClCH=CCl_2
Molecular mass: 131.4

CAS # 79-01-6
RTECS # KX4550000
ICSC # 0081
UN # 1710
EC # 602-027-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Risk of fire and explosion (see Chemical Dangers).		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
• **INHALATION**	Dizziness. Drowsiness. Headache. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Rest.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place (extra personal protection: self-contained breathing apparatus).	Separated from metals (see Chemical Dangers), strong bases, food and feedstuffs. Dry. Keep in the dark. Ventilation along the floor.	Do not transport with food and feedstuffs. IMO: Marine Pollutant Xn symbol R: 40 S: 23-36/37 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0081

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

TRICHLOROETHYLENE

ICSC: 0081

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes forming toxic and corrosive fumes (phosgene, hydrogen chloride, chlorine). The substance decomposes on contact with strong alkali producing dichloroacetylene , which increases fire hazard. Reacts violently with metals such as lithium, magnesium aluminium, titanium, barium and sodium. Slowly decomposed by light in presence of moisture, with formulation of corrosive hydrochloric acid.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 50 ppm; 269 mg/m^3 (STEL): 200 ppm; 1070 mg/m^3 (ACGIH 1992-1993).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes and the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidney (see notes).

PHYSICAL PROPERTIES

Boiling point: 87°C
Melting point: -73°C
Relative density (water = 1): 1.5
Solubility in water, g/100 ml at 20°C: 0.1
Vapour pressure, kPa at 20°C: 7.8
Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20° C (air = 1): 1.3
Auto-ignition temperature: 410°C
Explosive limits, vol% in air: 8-10.5
Octanol/water partition coefficient as log Pow: 2.42

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to water organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions. Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Do NOT use in the vicinity of a fire or a hot surface, or during welding. Technical grades may contain small amounts of carcinogenic stabilizers.

Transport Emergency Card: TEC (R)-723
NFPA Code: H2; F1; R0;

ADDITIONAL INFORMATION

ICSC: 0081 **TRICHLOROETHYLENE**

PERCHLOROETHYLENE TECH

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: PERCHLOROETHYLENE TECH
SAP Material No: 7396810 000 00B
General or Generic ID: CHLORINATED HYDROCARBON

Company

Ashland
Ashland Distribution Co. &
Ashland Specialty Chemical Co.
P. O. Box 2219
Columbus, OH 43216
614-790-3333

Emergency Telephone Number:
1-800-ASHLAND (1-800-274-5263)
24 hours everyday

Regulatory Information Number:
1-800-325-3751

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
PERCHLOROETHYLENE	127-18-4	100.0

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
Can cause eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes.

Skin
Can cause skin irritation. Prolonged or repeated contact may dry the skin. Symptoms may include redness, burning, and drying and cracking of skin, burns and other skin damage. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. This material can get into the lungs during swallowing or vomiting. This results in lung inflammation and other lung injury.

Inhalation
Breathing of vapor or mist is possible. Breathing this material may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits (See Section 8). Alcohol consumed before or after exposure may worsen harmful effects.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: redness of the face and neck, stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), central nervous system depression (dizziness, drowsiness, weakness, fatigue, nausea, headache, unconsciousness), temporary changes in mood and behavior, loss of coordination, confusion, irregular heartbeat, anesthesia, liver damage, and death.

Continued on next page

Target Organ Effects
Overexposure to this material (or its components) has been suggested as a cause of the following effects in laboratory animals: kidney damage, liver damage, Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans: mild effects on color vision.

Developmental Information
This material (or a component) has been shown to cause harm to the fetus in laboratory animal studies. Harm to the fetus occurs only at exposure levels that harm the pregnant animal. The relevance of these findings to humans is uncertain.

Cancer Information
Exposure to perchloroethylene has been shown to cause cancer in laboratory animals. It has been listed as a possible carcinogen by the International Agency for Research on Cancer and the National Toxicology Program.

Other Health Effects
No data

Primary Route(s) of Entry
Inhalation, Skin absorption, Skin contact, Eye contact, Ingestion.

4. FIRST AID MEASURES

Eyes
If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

Skin
Remove contaminated clothing. Flush exposed area with large amounts of water. If skin is damaged, seek immediate medical attention. If skin is not damaged and symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing
Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Inhalation of high concentrations of this material, as could occur in enclosed spaces or during deliberate abuse, may be associated with cardiac arrhythmias. Sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to this material. This material is an aspiration hazard. Potential danger from aspiration must be weighed against possible oral toxicity (See Section 3 - Swallowing) when deciding whether to induce vomiting. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions), liver, kidney, Individuals with preexisting heart disorders may be more susceptible to arrhythmias (irregular heartbeats) if exposed to high concentrations of this material.

Continued on next page

5. FIRE FIGHTING MEASURES

Flash Point
Not applicable

Explosive Limit
No data

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide, chlorine, hydrogen chloride, phosgene.

Fire and Explosion Hazards
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No flash to boiling point. This product contains halogenated solvents which inhibit flashing until the halogenated solvent has been evaporated away. The product may become combustible or flammable after this occurs. Vapors are heavier than air and may travel along the ground or may be moved by ventilation and ignited by pilot lights, other flames, sparks, heaters, smoking, electric motors, static discharge, or other ignition sources at locations distant from material handling point.

Extinguishing Media
regular foam (such as AFFF), water fog, carbon dioxide, dry chemical.

Fire Fighting Instructions
Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes. Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

NFPA Rating
Health - 2, Flammability - 0, Reactivity - 0

6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

Large Spill
Prevent run-off to sewers, streams or other bodies of water. If run-off occurs, notify proper authorities as required, that a spill has occurred. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source, dike area of spill to prevent spreading, pump liquid to salvage tank. Remaining liquid may be taken up on sand, clay, earth, floor absorbent, or other absorbent material and shoveled into containers.

Continued on next page

7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage
Store in a cool, dry, ventilated area away from sources of heat, moisture, and incompatible substances. Do not allow moisture or water contamination of product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. Consult your safety representative.

Skin Protection
Wear resistant gloves (consult your safety equipment supplier). To prevent skin contact, wear impervious clothing and boots.

Respiratory Protections
If workplace exposure limit(s) of product or any component is exceeded (see exposure guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

Exposure Guidelines
Component

PERCHLOROETHYLENE (127-18-4)
OSHA PEL 100.000 ppm - TWA
OSHA PEL 200.000 ppm - Ceiling
OSHA VPEL 25.000 ppm - TWA
ACGIH TLV 25.000 ppm - TWA
ACGIH TLV 100.000 ppm - STEL

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for product) 250.0 F (121.1 C) @ 760 mmHg

Continued on next page

Vapor Pressure
(for product) 14.000 mmHg @ 68.00 F

Specific Vapor Density
5.760 @ AIR=1

Specific Gravity
1.618 - 1.622 @ 77.00 F

Liquid Density
13.520 lbs/gal @ 77.00 F
1.620 kg/l @ 25.00 C

Percent Volatiles
100.0 %

Volatile Organic Compounds (VOC)
.000 %
> 999.000 g/l
13.520 lbs/gal

Evaporation Rate
2.80 (N-BUTYL ACETATE)

Appearance
COLORLESS CLEAR LIQUID

State
LIQUID

Physical Form
NEAT

Color
CLEAR, APHA COLOR 15 MAX

Odor
MILDLY SWEET ODOR

pH
No data

Viscosity
1.0 cps

Freezing Point
-2.0 F (-18.8 C)

Molecular Weight
185.8

Solubility in Water
SLIGHT (.015GM/100GM)

Octanol/Water Partition Coefficient
3.400

Continued on next page

Bulk Density
1.810 lbs/ft3

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide, chlorine, hydrogen chloride, phosgene, Avoid contact with open flame, welding arcs, resistance heaters, etc., which can result in thermal decomposition releasing hydrogen chloride and small amounts of phosgene and chlorine.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: alkali metals, aluminum, barium, strong acids, strong oxidizing agents.

11. TOXICOLOGICAL INFORMATION

No data

12. ECOLOGICAL INFORMATION

No data

13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations. For assistance with your waste management needs - including disposal, recycling and waste stream reduction, contact Ashland Distribution Company, IC&S Environmental Services Group at 800-531-7106.

14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101
DOT Description:
TETRACHLOROETHYLENE MIXTURE,6.1,UN1897,III

Container/Mode:
55 GAL DRUM/TRUCK PACKAGE

Continued on next page

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101

Product Quantity (lbs)	Component
100	PERCHLOROETHYLENE

Other Transportation Information
The Transport Information may vary with the container and mode of shipment.

15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4(a)

Component	RQ (lbs)
TETRACHLOROETHYLENE	100

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed(X) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65

Section 313 Component(s)	CAS Number	%
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)	127-18-4	100.00

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations

Inventory Status
ACOIN (AUSTRALIA) The intentional ingredients of this product are listed.
DSL (CANADA) The intentional ingredients of this product are listed.
EINECS (EUROPE) The intentional ingredients of this product are listed.
ENCS (JAPAN) The intentional ingredients of this product are listed.
TCCL (KOREA) The intentional ingredients of this product are listed.

State and Local Regulations

California Proposition 65
The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986: This product contains the following substance(s) known to the state of California to cause cancer.
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

Continued on next page

New Jersey RTK Label Information

TETRACHLOROETHYLENE	127-18-4

Pennsylvania RTK Label Information

ETHENE, TETRACHLORO-	127-18-4

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

APPENDIX B

Sampling Forms/Logs

ROBERTS
ENVIRONMENTAL SERVICES, LLC
2112 Carmen Court ▲ Goshen, IN ▲ Ph: (574) 537-0881

FIELD BORING LOG

CLIENT:_____ PAGE_____OF_____
LOCATION:_____ PROJ. NO.:_____
PURPOSE:_____ DATE:_____

BORING NO.	SAMPLE DEPTH (ft)	SAMPLE TIME	% RECOV.	LAB	Analysis	FID (ppm)	DEPTH (ft) FROM	DEPTH (ft) TO	SOIL DESCRIPTION
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:____				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				
					VOCs, ERO, GRO, PAHs, SVOCs, METALs _____Bottles:___				

ROBERTS ENVIRONMENTAL SERVICES, LLC

2112 Carmen Court *Ph: (574) 537-0881*
Goshen, Indiana 46526 *Fax: (574) 537-9021*

QUALITY, COST-EFFECTIVE ENVIRONMENTAL CONSULTANTS

MONITORING WELL SAMPLING FORM

Project Name:_____

Project Number:_____

Location:_____

Sampler(s):_____

Field Equipment (begin/end day checks or calibration)

pH:_____ D.O.:_____

Cond:_____ ORP:_____

Temp:_____ See back side for cooler temp.

SAMPLING & FIELD MEASURMENTS/OBSERVATIONS					
Sample Location I.D.:					
Date of Sampling:					
Sampled By:					
Weather Conditions (rain, snow, wind, temp., etc.)					
Top of Casing Elevation (if known):					
Top of Casing to Grade (ft):					
Static Water Level (ft) from TOC:					
Measured Well Depth (ft) from TOC:					
Volume of Water Column* (gal) (one well volume):					
Gallons Purged/#Casing Volumes:	3+-/	3+-/	3+-/	3+-/	3+-/
Purging/Sampling Device(s):					
Well Purged Dry? (Y/N):					
Time Purging Completed (military):					
Time Sample Withdrawn (military):					
Temperature / F (+/- 3%)	1)	1)	1)	1)	1)
	2)	2)	2)	2)	2)
	3)	3)	3)	3)	3)
	4)	4)	4)	4)	4)
Conductivity / mS/cm (+/- 3%)	1)	1)	1)	1)	1)
	2)	2)	2)	2)	2)
	3)	3)	3)	3)	3)
	4)	4)	4)	4)	4)
Field Oxydation Reduction Potential (ORP) (mV): (+/- 10 mv)	1)	1)	1)	1)	1)
	2)	2)	2)	2)	2)
	3)	3)	3)	3)	3)
	4)	4)	4)	4)	4)
Field pH (std. units): (+/- 0.1)	1)	1)	1)	1)	1)
	2)	2)	2)	2)	2)
	3)	3)	3)	3)	3)
	4)	4)	4)	4)	4)
DO (ppm) - (final reading)					
Color:					
Odor:					
Turbidity (clear, cloudy, etc.):					
Other Observations/Notes: (FD or MS/MSD, etc.)					

** Gallons Per Foot of Water Column for Well Dia.: 1"=0.041 2"=0.163 3"=0.367 4"=0.653 5"=1.020 6"=1.469 3/4"=0.023*

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Goshen, Indiana 46526 *Fax: (574) 537-9021*

QUALITY, COST-EFFECTIVE ENVIRONMENTAL CONSULTANTS

SAMPLE LOG

Page _____ of _____

PROJECT NO:_____ SAMPLER:_____

PROJECT NAME:_____ LOCATION:_____ DATE:_____

SAMPLE I.D.	DEPTH (ft)	DATE	TIME	SAMPLE TYPE (Soil, Water, etc)	LOCATION	DESCRIPTION	FID/NOTES/OTHER

ROBERTS
ENVIRONMENTAL SERVICES, LLC

2112 Carmen Court Goshen, Indiana 46526
Ph: (574) 537-0881 Fax: (574) 537-9021
www.robertsenvserv.com

Matrix Codes:
Water = W
Soil/Sediment = S
Sludge = SG
Wastewater = WW
Wipe = WP
Other = O

LABORATORY CHAIN-OF-CUSTODY DOCUMENT

PAGE___of___

PROJECT INFORMATION:
Project #:_____
Project Name:_____
RES Contact:_____
Other:_____

SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	CONTAINER TYPE (X)		MATRIX CODE	SAMPLE DATE	SAMPLE TIME	PRESERVATION (X)							REQUESTED ANALYSIS	LAB I.D.
		Glass	Plastic				Cool 4°C	HCl	H_2SO_4	HNO_3	NaOH	Methanol	Other		

CUSTODY INFORMATION			
SAMPLER:	*(Signature)*	LABORATORY:	
	(Print)	INSTRUCTIONS TO LAB:	
RELINQUISHED BY:	*(Signature)*	DATE:	SHIPPING INFORMATION:
	(Print)	TIME	RECEIPT INFORMATION:
RECEIVED BY:	*(Signature)*	DATE:	OTHER:
	(Print)	TIME	